US LHC Accelerator Research Program

bnl - fnal- lbnl - slac

SLAC Phase II Collimation Task Schedule & Budget

07 April 2005

LARP Collaboration Meeting

Port Jefferson NY

Tom Markiewicz
SLAC

From FY05 Task Sheet

Overall Plan:

FY 2004:	Introduction to project
FY 2005:	Phase II CDR and set up of a collimator lab at SLAC
FY 2006:	Tests of RC0, Design and construction of RC1
FY 2007:	Tests of RC1 (two rounds), design and construction of RC2
FY 2008:	Non-Beam Tests of RC2
FY 2009:	RC2 beam tests & final drawing package for CERN
FY 2010:	Await production & installation by CERN
FY 2011:	Commissioning support

FY 2005 Tasks

Verify/understand collimator efficiency calculations with Sixtrack assuming collimator locations fixed in lattice

- Efficiency as function of collimator material, jaw length & gap
- Impact distributions as input to FLUKA

Energy deposition studies

- FLUKA

Material response study

- ANSYS for temperature profiles & deformation given a geometry and cooling scheme

Conceptual Engineering design

Increase Mech. Engineering design effort (draw from within SLAC)

Hire postdoc

Find, assemble & equip semi-clean space to assemble & test prototypes

FY 2005 Milestones & Deliverables

Milestones:

- Preliminary results presented in first half of 2005
- Phase II collimator review
- Enclosed semi-clean lab

Deliverables

- – Written conceptual design

SLAC FY05 Budget Estimate

Subproject	Item	Cost Type	Cost SubType	Count	Units	Cost Basis	Cost	Burdened Cost	Total,escalated
		Carryover							($99,000)
CDR	Tor's postdoc	Labor	Postdoc	0.25	FTE	LARP	$25,000	$25,000	$27,000
CDR	Markiewicz, Thomas	Labor	Physicist	0.10	FTE	LARP	$20,000	$20,000	$21,000
CDR	Keller, Lew	Labor	Physicist	0.10	FTE	LARP	$20,000	$20,000	$21,000
CDR	Cai Yunhai	Labor	Physicist	0.10	FTE	LARP	$20,000	$20,000	$21,000
CDR	Doyle, Eric	Labor	ME	0.50	FTE	LARP	$100,000	$100,000	$106,000
CDR	Travel	M&S		20.00	k$	SLAC	$20,000	$21,360	$23,000
Infrastructure	Equipped Clean Room	Shop		2.00	Man-weeks	SLAC	$5,000	$6,800	$7,000
Infrastructure	Equipped Clean Room	M&S		58.00	k$	SLAC	$58,000	$61,944	$66,000
		Budgeted							($190,000)
		Total							$3,000

Budget Comments:

- LARP is getting much more than 0.8 FTE Labor
- We still plan to advertise for a postdoc this FY
  - Advert written
- We still plan to prepare lab space this FY
- We are beginning discussions to increase engineering effort
- We hope to attract more physicist simulation expertise at low or no cost to LARP

Discussion of FY05 Milestones & Deliverables

- You have seen status of design
  - It is not clear yet that “Conceptual Design” will meet LHC requirements
  - We are actively working to refine design

“Present Preliminary Results” was envisaged to be a presentation to CERN people to see if they thought design was worth pursuing
  - Perhaps this meeting with Ralph present satisfies that milestone

“Phase II Collimator Review” was envisaged to be the “Go, No-Go” meeting
  - Recall comments from opening talk

PowerPoint can be converted to Word whenever a “CDR” is desired

This may all be according to previously presented schedules (see next slides) as we discussed need for “TDR” [mechanical drawings] before prototype construction would begin

FY 2006 Goals
Design & Build RC1

"RC1" is a prototype made of non-exotic UHV compatible materials test mechanical design under artificial heat load

- Design RC1
  - Finalize mechanical specs
  - Produce drawing package
  - Heating elements: Location, Type
  - Monitoring: Thermocouples, Vacuum gauges, Gap Sensors
- Build RC1
  - Interior assembly: Materials, Shop, Assembly
  - Vacuum system: Materials, Shop, Assembly

Budget implications for FY06

- Full time postdoc to interface with engineer and run tests
- Increased engineering
- M&S & Shop charges for construction
- Designer to help engineer with drawings

SLAC FY06 Budget Request

Total 748k

Subproject	Item	Cost Type	Cost SubType	Count	Units	Cost Basis	Cost	Burdened Cost	Total,escalated
		Carryover							$3,000
TDR	ME	Labor	ME	1.00	FTE	LARP	$200,000	$200,000	$219,000
TDR	SLAC Postdoc	Labor	Postdoc	1.00	FTE	LARP	$100,000	$100,000	$109,000
TDR	Markiewicz, T.	Labor	Physicist	0.10	FTE	LARP	$20,000	$20,000	$22,000
TDR	Keller, Lew	Labor	Physicist	0.10	FTE	LARP	$20,000	$20,000	$22,000
TDR	Cai Yunhai	Labor	Physicist	0.10	FTE	LARP	$20,000	$20,000	$22,000
RC1	Mech. Designer	Labor	Designer	0.25	FTE	LARP	$30,000	$30,000	$33,000
Travel	Travel	M&S		30.00	k$	SLAC	$30,000	$32,040	$35,000
RC1 Interior Mechanism	Parts	M&S		50.00	k$	SLAC	$50,000	$53,400	$58,000
RC1 Interior Mechanism	Fabrication	Shop		16.00	Man-weeks	SLAC	$40,000	$54,400	$59,000
RC1 Interior Mechanism	Assembly	Shop		8.00	Man-weeks	SLAC	$20,000	$27,200	$30,000
RC1 Vacuum	Parts	M&S		20.00	k$	SLAC	$20,000	$21,360	$23,000
RC1 Vacuum	Fabrication	Shop		8.00	Man-weeks	SLAC	$20,000	$27,200	$30,000
RC1 Vacuum	Assembly	Shop		4.00	Man-weeks	SLAC	$10,000	$13,600	$15,000
RC1 Thermal Test	Parts	M&S		20.00	k$	SLAC	$20,000	$21,360	$23,000
RC1 Thermal Test	Fabrication	Shop		8.00	Man-weeks	SLAC	$20,000	$27,200	$30,000
RC1 Thermal Test	Assembly	Shop		4.00	Man-weeks	SLAC	$10,000	$13,600	$15,000

FY 2007 Goals
RC1 Testing - Design & Build RC2

- RC1 Tests
  - Test RC1 inner mechanism in air
  - Test RC1 under vacuum
  - Test RC1 under heat load in vacuum
  - Iterate tests as needed
- Design, Build and Test “RC2”, a beam-test capable prototype with exotic materials
  - Design RC2
    - Adapt to exotic materials
      - Be, Cu loaded Carbon, AlbuMet, Gum Metal,
    - Control system capability
    - External Mover system
    - Alignment system
    - External BPM system
    - Cooling channels
    - Remote Instrumentation & Control
  - Build RC2
    - Parts: BPMs, Movers, Bellows, I&C Hardware
    - Fabrication
    - Assembly

SLAC FY2007 Budget Estimate

Total 987k

Subproject	Item	Cost Type	Cost SubType	Count	Units	Cost Basis	Cost	Burdened Cost	Total,escalated
RC1	ME	Labor	ME	1.00	FTE	LARP	$200,000	$200,000	$225,000
RC1	Physicist	Labor	Physicist	0.25	FTE	LARP	$50,000	$50,000	$56,000
RC1	Postdoc	Labor	Postdoc	1.00	FTE	LARP	$100,000	$100,000	$113,000
RC1	Mech. Designer	Labor	Designer	0.50	FTE	LARP	$60,000	$60,000	$68,000
Travel	Travel	M&S		20.00	k$	SLAC	$20,000	$21,360	$24,000
RC1 Tests and Rebuild	Parts	M&S		10.00	k$	SLAC	$10,000	$10,680	$12,000
RC1 Tests and Rebuild	Fabrication	Shop		4.00	Man-weeks	SLAC	$10,000	$13,600	$15,000
RC1 Tests and Rebuild	Assembly	Shop		8.00	Man-weeks	SLAC	$20,000	$27,200	$31,000
RC2 Interior	Parts	M&S		100.00	k$	SLAC	$100,000	$106,800	$120,000
RC2 Interior	Fabrication	Shop		32.00	Man-weeks	SLAC	$80,000	$108,800	$122,000
RC2 Interior	Assembly	Shop		16.00	Man-weeks	SLAC	$40,000	$54,400	$61,000
RC2 Vacuum	Parts	M&S		40.00	k$	SLAC	$40,000	$42,720	$48,000
RC2 Vacuum	Fabrication	Shop		16.00	Man-weeks	SLAC	$40,000	$54,400	$61,000
RC2 Vacuum	Assembly	Shop		8.00	Man-weeks	SLAC	$20,000	$27,200	$31,000

FY2008 Goals

RC2 Non-Beam Tests

- Air test of RC2
- Vacuum Tests of RC2

Preparation for Beam tests of RC2

- Transport to beam facility
- Installation
- Alignment
- In-situ tests without beam

FY2009-11 Goals

- 2009 Goals : RC2 beam tests & Final drawing package
  - Beam Tests of RC2 in Fall 2008
  - Design and produce complete drawing package for industry-produced collimators
    - As close to RC2 as possible
    - Not thought to need a prototype unless RC2 shows need for substantial design modifications
- 2010 Goals: Production Support
  - Support the industrial production of the required number (5-10) of collimators, presumably by CERN unless it is decided otherwise at a later date.
- 2011 Goals: Installation & Commissioning support
  - Participate in installation and commissioning of final collimators

Phase II Collimator Budget Summary

LAB	FY	Labor	M&S	Shop	Total
FNAL	2005	$27,000			$27,000
	2006	$27,000			$27,000
FNAL Total		$54,000			$54,000
SLAC	2004		$11,000		$11,000
	2005	$196,000	$89,000	$7,000	$292,000
	2006	$427,000	$139,000	$179,000	$745,000
	2007	$462,000	$204,000	$321,000	$987,000
	2008	$603,000	$50,000	$95,000	$748,000
	2009	$621,000	$65,000	$32,000	$718,000
	2010	$245,000	$26,000		$271,000
	2011	$381,000	$81,000		$462,000
SLAC Total		$2,935,000	$665,000	$634,000	$4,234,000
Grand Total		$2,989,000	$665,000	$634,000	$4,288,000

Phase II Collimator Labor Summary

LAB	FY	Designer	EE	ME	Physicist	Postdoc	Grand Total
FNAL	2005					0.25	0.25
	2006					0.25	0.25
FNAL Total						0.5	0.5
SLAC	2005				0.5	0.3	0.25	1.05
	2006	0.25			1	0.3	1	2.55
	2007	0.5			1	0.25	1	2.75
	2008	1		0.25	1	0.25	1	3.5
	2009	1		0.25	1	0.25	1	3.5
	2010				0.25	0.25	1	1.5
	2011				0.5	0.5	1	2
SLAC Total		2.75		0.5	5.25	2.1	6.25	16.85
Grand Total		2.75		0.5	5.25	2.1	6.75	17.35